

The book makes no claim to be a complete treatise, but rather to deal with those branches of the science with which the author is best acquainted, one might almost say, those parts at which he has himself worked, either originally or by way of verifying the work of others. As might be expected from such a scheme, the descriptions of apparatus and phenomena are admirable, but, unfortunately, the theoretical explanations, intended to give the book more or less the character of a systematic treatise, are neither clear nor accurate. So early as page 2 we read : "It is found that if equal quantities of the electricity of glass and the electricity of sealing-wax be added together they neutralise each other." But this is not preceded by any explanation of what is meant by equal quantities of the electricities of glass and sealing-wax. If the sentence had been cast as a definition, it would have been comprehensible. On page 20 there is an extraordinary illustration of the medium supposed to transmit electrostatic forces :—

"The transmission of strain may be very beautifully seen at any railway-station when shunting is going on, if a train of carriages is being pushed by an engine which happens, instead of giving a steady pressure, to strike a slight blow on the carriage nearest to it. The furthest carriage does not move at once, but the buffer springs are compressed—that is, the first carriage is for an instant strained by having its total length shortened by some inches. It instantly recovers from this strain by the expansion of the springs; but as it cannot expand towards the engine, it expands away from it, and transmits the strain to the next carriage by compressing its buffer-springs, and the process is repeated all the way from the engine to the carriage furthest from it."

This buffer experiment is an illustration of wave-motion, an idea we do not need in any theory of electrostatics. On page 23 there is a popular explanation from the pen of Prof. Ayrton of the easy discharge of electricity from points; this remarkable explanation does not in any way depend on the greater electric surface density at and near a point, and it suggests that the force near a conductor is *not* normal to its surface. It is unnecessary to pursue this criticism further; we have said enough to show that Mr. Gordon's strength does not lie in the systematic exposition of electrical theory.

The book is divided into four parts—Electrostatics, Magnetism, Electrokinetics, and Electro-optics. In the third part is included all the phenomena of current electricity. This is an unsatisfactory classification. Electrokinetics should be confined to those phenomena of current electricity which involve the kinetic energy of current, such as electromagnetism and electromagnetic induction. The author would have been wiser to have followed the arrangement of Maxwell, and have classed the steady flow of electricity in conductors at rest rather with electrostatics than electrokinetics. Adams's experiments on equipotential lines and surfaces in conductors are interpolated between diamagnetism and the induction coil; they are, of course, naturally a part of the theory of electrical resistance, and have no near connection with the chapter preceding or following.

Great care has been bestowed on the illustration of the work. We know of no book on electricity so beautifully illustrated. Nor are the pictures merely pictures. They show well the details of apparatus; often, too, some

leading dimensions are given when perspective does not admit of a scale. We would recommend this practice to all writers on science. It is a great help to the imagination to know how large a thing is, and better that this information should be upon the picture than in the text only.

In the construction of this book the freest use has been made of the scissors, whole pages being quotations. This is both wise and modest, for when the original works of the man who discovered and stated a fact are suitable for a treatise, there can be no use in paraphrasing them. Some of the chapters are excellent analyses of the several investigations which have been made into the subjects of which they treat. This is notably the case with the chapter on "Specific Inductive Capacity." When Mr. Gordon has occasion to prepare a new edition he will do well to expand where he is strongest, to omit as far as possible systematic exposition, but to make each chapter a history to which the reader may refer with confidence that he will there find a clear account of every original experiment, English or foreign, that has been tried in that department. The value of such a work would be incalculable.

STRATIGRAPHICAL GEOLOGY

Lethaea geognostica, oder Beschreibung und Abbildung der für die Gebirgs-Formationen bezeichnendsten Versteinerungen. Herausgegeben von einer Vereinigung von Paläontologen. I. Thcil: *Lethaea palæozoica*, von Ferd. Roemer. Textband: Erste Lieferung. Pp. 324. (Stuttgart, 1880.)

THE study of fossils may be approached from two distinct points of view: we may regard them as furnishing us with additional illustrations of the diversities of form and structure in the animal and vegetable kingdoms, or we may study them as making their appearance in a certain definite order, and thus as characterising particular geological formations. The former is the point of view of the biologist, the latter that of the stratigraphical geologist. Palæontology, or the study of fossil forms, must necessarily be pursued as a branch of biology, for only by the study of their nearest recent analogues can we hope to interpret the fragmentary and often obscure relics of former inhabitants of the globe; but, on the other hand, the progress of systematic geology has been bound up with the study of fossils ever since it has been clearly recognised that strata can be identified by the organic remains which they contain.

German scientific literature is now being enriched by the publication of two very valuable works in which fossils are treated of, in the one case from the stand-point of the biologist, in the other from that of the stratigraphical geologist. The admirable treatise on palæontology by Zittel and Schimper gives an excellent account of the chief types of fossil plants in their relations to living forms, and the work of which we have placed the title at the head of the present article, promises to supply an equally important contribution to stratigraphical geology.

The title of "Lethaea Geognostica" was first employed by Brönn, who between the years 1835 and 1837 published a work under this name, in which he described all the

fossil genera then known in the several geological formations. This book, which was accompanied by an excellent atlas of plates, passed through three editions during the author's life-time, but in the preparation of the last of these he was aided by Dr. Ferdinand Roemer.

The number of fossil forms now known to geologists is so vast that it would be impossible to find any palæontologist competent to deal equally well with the faunas and floras of all the geological periods; and hence it has been decided to commit the palæozoic, the mesozoic, and the tertiary divisions of the work to different hands. Dr. Ferd. Roemer has been selected to describe the life-forms of the palæozoic rocks, and in the work before us we have the first instalment of the result of his labours.

The work commences with a sketch of the succession and correlation of the palæozoic strata in all the different areas in which they have been studied. The author divides these rocks into the four groups of Silurian, Devonian, Carboniferous, and Permian, using the term Silurian, after the manner of Murchison, to embrace all the lower palæozoic strata. This plan is, of course, open to the objection that his first division is at least equal in value to the other three put together. The account of the palæozoic strata as developed in different areas, which extends to ninety-two pages, is generally very carefully drawn up. We notice on pages 11 and 29 an unfortunate error in the grouping together of the Lower Llandeilo and the Tremadoc slates, while in his account of the succession of strata in Sweden the author has failed to avail himself of the most recently published results arrived at by the palæontologists of that country.

The next twenty pages of the work are devoted to the palæontological literature of the palæozoic rocks, 146 pages to the palæozoic plants, and seventy-seven pages to the Protozoa. The author describes each genus, and gives also an account of some of the more important species. In noticing the earliest palæozoic plants, Roemer follows Schimper in regarding the puzzling forms from Bray Head, called *Oldhamia* by Edward Forbes, as belonging to the Algae. With regard to the so-called *Eozoon canadense* of Dawson, Dr. Ferd. Roemer accepts the verdict of Möbius against its organic origin, and rejects it from the list of palæozoic fossils.

The atlas of the "Lethæa Palæozoica" was published four years ago, the plates, sixty-two in number, being well executed and of the same size as the text, thus getting rid of the inconvenient arrangement in the former work, where the text was in 8vo, and the plates in folio. It would almost appear as if the atlas were drawn up previous to, and quite independently of, the present work, so that the connection between the illustrations and the text is not so close as might be wished. We cannot help remarking, too, that unless much greater expedition is used in publishing the remainder of the work, the earlier portions will become obsolete before the later portions make their appearance.

Although the atlas appeared in 1876, the text has now only just reached the commencement of the Cœlenterata. Possibly some unavoidable cause of delay has arisen, which, we may hope, is now removed. We look forward with interest to the completion of this most valuable work.

OUR BOOK SHELF

A Treatise on Elementary Dynamics, for the Use of Colleges and Schools. By William Garnett, M.A. Second Edition. (Cambridge : Deighton and Co., 1879.)

MR. GARNETT'S second edition does not differ in appearance from its predecessor. There is the same number of chapters, the headings of which for the most part are also the same, but new matter and more detailed explanation have resulted in the addition of some twenty-five pages. It may be noted as a feature of Mr. Garnett's work that there is a chapter on "The Dynamical Theory of Gases," and a good one on "The Dimensions of Units." We have used the first edition with great advantage, as the author fully discusses and illustrates the *crucis* of this subject, which is often so difficult to beginners, and we commend this improved edition to such readers and to all others.

Elementary Applied Mechanics. By Thomas Alexander, C.E. (London : Macmillan, 1880.)

THE object of Mr. Alexander's work is to serve as a companion volume to the late Prof. Rankine's "Applied Mechanics and Civil Engineering." This first part treats of internal stress and strain, the divisions being elasticity, resilience; pure strain, simple and compound; the ellipse of stress; and the application of earthwork. All these points appear to us to be well illustrated by the numerous worked-out exercises, with carefully drawn figures, and by the exercises left for the student to try his skill upon. This small book, drawn up, we presume, with reference to Prof. Alexander's Japanese students at the Imperial Engineering College at Tokei, is likely to be of service, the more so as it appears, to the extent we have tried it, to be correctly printed.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*]

[*The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.*]

The Recent Gas Explosion

"THE explosion took place by the conversion of potential energy into motion."

It may be fairly asked whether physicists are really satisfied with this account of the tremendous development of energy recently witnessed in the neighbourhood, or whether this phrase "potential energy" is not a useless bugbear which is closing the door to discovery. Why not believe rather that the motion exhibited was not really created (as motion) at all, but already existed in a concealed form? For we have plenty of proof that motion can be stored up to any intensity and yet be quite imperceptible to the senses, so long as all is in equilibrium. Why assume a supernatural (?) cause, when we have a natural one of transferred motion? Why rush into the inconceivable assumption of the existence of an energy *without motion*, when the conceivable remains for appreciation? An important and highly interesting problem in the discovery of the *modus operandi* of the transference of the motion from matter in space would thus be ever present to the mind (which is the sole condition for hoping to solve it) in place of an unrealisable and—may we not justly add?—therefore shallow and pretentious mysticism which obstructs the pathway of progress.

S. TOLVER PRESTON

[It seems to us that Mr. Preston makes rather too much of a chance newspaper expression, probably employed (for the sake of appearing scientific) by a writer who had no notion of the tremendous metaphysical problem which underlies it. It is very probable that all energy is kinetic, but this has not yet been proved.—ED.]